THE
MADREPORARIA OF THE SIBOGA-EXPEDITION
PART III
EUPSAMMIDAE

Siboga-Expeditie
XVIc

THE MADREPORARIA OF THE SIBOGA EXPEDITION

PART III

EUPSAMMIDAE

BY

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SYSTEMATICAL ACCOUNT.

Fam. EUPSAMMIDAE.

There is a general rule in the relation between the septa in this family. Of the twelve original septa (LACAZE-DUTHIERS 1897) six become the septa of the first order and first cycle, the six alternating ones becoming the septa of the second order. The septa of higher orders are formed two at a time, always at one side only of the septa of the second order. They are shorter than the latter, with which they are united by their central ends. In this way we get three septa — those of the second, third and fourth order — forming a triangle whose base is the section of the margin enclosed by the septa of the second and third orders, and whose apex points towards the columella, but does not reach it. The septum of the fourth order forms an axis of symmetry between the two others, being in line with the central portion of the septum of the second order, whose peripheral portion bends outward to form one of the sides of the triangle. It may be clear from this that my septum of the fourth order is the same as the septum of the second order or cycle of authors.

The formation of septa of higher orders goes on in the same way, always two septa at the same time, which unite with the older septum to form triangles in which the septum of the highest order is the axis of symmetry. Newly formed septa unite always with the lateral septa, never with the axis of symmetry of the triangle.

The formation of new septa goes on faster at the side of the older of the two lateral septa, thus establishing it as a septum of lower order. So we get again an asymmetry. This asymmetry may be temporary or permanent. But it is difficult if not impossible to say which it is in a given species.

It may be clear from this that there is no real difference between the genus *Balanophyllia* and the genus *Rhodopsammia*: the difference being based on an assumed difference between the septa; so the genus *Rhodopsammia* must be absorbed in *Balanophyllia*.

I found the same relation between the septa of different orders in all the genera of the *Eupsammidae* that I could examine, except two, viz. *Stephanophyllia* and *Leptopsammia*. According to MILNE-EDWARDS and HAIME the genus *Endopsammia* wholly agrees with *Leptopsammia* in respect to the septa; may be it is better to unite these two genera in a single one. POURTALÈS says (1878) that this genus *Trochopsammia* has non-coalescent septa; I could not examine that

genus, which may also be an exception. The difference in the genus *Stephanophyllia* is only a slight one; the axes of symmetry are wanting here, except the first one, i. e. the septum of the fourth order. But in *Leptopsammia* new septa are formed, or can be formed, on both sides of an older septum and this is a well-marked difference from all the other genera of the family. LACAZE-DUTHIERS has pointed out that difference very clearly in his figures 3 and 12 on Plate XI (LAC.-DUTH. 1897).

For systematical purposes I will make a difference between the terms order and cycle, the former indicating the genetic sequence of the septa as I have pointed out previously. The septa of different orders are never complete in the *Eupsammidae* whenever it is possible that there are more septa of the same order. The term cycle — in systematical descriptions of more importance — I will use in the sense employed by most authors. The cycles may be complete or incomplete. The difference between the orders and cycles and their respective sequence are illustrated in the figures 1 and 2.

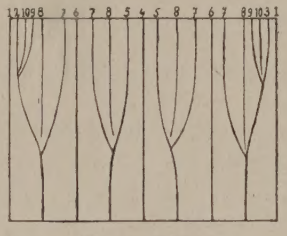

Fig. 1. orders.

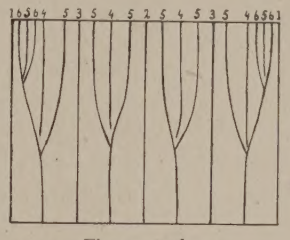

Fig. 2. cycles.

The definition of the genus *Thecopsammia* is according to POURTALÈS (1871) "corallum simple, attached, without costae, covered with a complete epitheca". In the genus *Balanophyllia* there are species without any trace of an epitheca, other species with a thin epitheca, leaving the ribs still visible, and others again (e. g. *Bal. gigas*) with a dense epitheca covering about three quarters of the corallum, through which no ribs are visible. So I am wholly in accordance with DUNCAN (1873) who says: The epitheca, which is strongly developed in some species of the genus (*Balanophyllia*), affords but secondary characters for differentiation; consequently the genus must include *Thecopsammia* of POURTALÈS.

Dendrophyllia de Blainville.

This genus is nearly allied to the genus *Balanophyllia*; it is practically impossible to distinguish young *Dendrophyllias* with only one calicle from true *Balanophyllias*. In the older *Dendrophyllia* the corallum is always compound; the young corallites, formed by budding, remain connected with the parental stem. In *Balanophyllia* budding can take place too, but the newly formed corallites tend to separate from the parental corallite and often do so, though they can remain connected for a long time, may be during their whole life.

The identification of the incrusting species is very difficult. Many species are described but not always satisfactorily. I have before me five different incrusting species — at least I think they are different. But I could identify only three as formerly described species and even that with some hesitation.

1. *Dendrophyllia micranthus* (Ehrb.).

Oculina micranthus Ehrenberg 1834.
Dendrophyllia nigrescens Dana 1846.

Dendrophyllia? nigrescens Milne-Edwards 1860.
Coenopsammia nigrescens Milne-Edwards 1860.
Dendrophyllia? micranthus Milne-Edwards 1860.
Coenopsammia aequiserialis Milne-Edwards 1860.
Coenopsammia aequiserialis Verrill 1864.
Coenopsammia aequiserialis Semper 1872.
Cönopsammia micranthus Klunzinger 1879.
Dendrophyllia aequiserialis Quelch 1886.
Coenopsammia nigrescens Ortmann 1888.
Coenopsammia micranthus Ortmann 1888.
Dendrophyllia nigrescens Vaughan 1918.

Stat. 234. Nalahia-bay, Nusa-Laut-island. Depth 46 meter. 1 ex.
Stat. 240. Banda. 1 ex.
Stat. 277. Kulewatti-(Sollot-)bay, Dammer-island. Depth 45 meter. 12 ex.
Stat. 303. Haingsisi. 3 ex.
Billiton. 1 ex. — Red Sea. 3 ex. — Japan. 1 ex. — Red Sea. Leiden Mus. 3 ex. — Java. JUNGHUHN leg. Leiden Mus. 2 ex. — Amboina. HOEDT leg. Leiden Mus. 1 ex. — Locality unknown. Leiden Mus. 2 ex.

According to KLUNZINGER the difference between *D. micranthus* (Ehrenberg) and *D. nigrescens* Dana is that the latter has no ribbed surface, and DANA's figure shows (says KLUNZINGER) that the calicles are all short and not arranged in two rows and that the branches are situated in the same plane. Now the specimen of Stat. 234, a fine big specimen, agrees perfectly both in the arrangement of the branches and the situation of the calicles with DANA's figure. It is beyond all doubt that it belongs to the same species as DANA's specimen. Only the surface is ribbed, whenever not so clearly and regularly as in the *D. ramea* of the Mediterranean, and the ribs are a little coarser than in that species. On the thinner branches the calicles are situated in two rows — this is shown very clearly also by DANA's figure in fact — in each row the calicles bend alternating forward and backward. By the growth in thickness of the branch these alternating calicles are pushed away from each other, so that they come to lie more and more on the front- and backside of the branch. In this manner the regularity decreases. Moreover secondary calicles are formed on the front- and backside. In this way the regularity in the arrangement of the calicles has disappeared altogether in the oldest part of the colony. The same arrangement of the calicles — regular in two rows on the endbranches, irregularly distributed on the thicker branches — can be seen in several specimens, which have the branches arranged in every direction, though not to the same extent. There seems to be a connection between the arrangement of the calicles and the method of branching. When the branches are all situated in the same plane, the thicker ones especially are so crowded that no room is left for the calicles between them; the calicles have to push forward and backward. This is of course not the case when the branches are arranged in all directions. As I have among my material every degree from branching in one direction to branching in all directions this does not give any support for a separation between *D. nigrescens* and *D. micranthus*. According to the general statements of WOOD JONES (1910) about the growth of corals *D. nigrescens* is that form of the species which grows in streaming water, the flat side of the coral is perpendicular to the direction of the current.

There is also no real difference in the length of the calicles, though KLUNZINGER says there is. Further the ribs on the surface do not give any support. In the typical *D. nigrescens* I found them as well developed as in the typical *D. micranthus*. Also in ORTMANN's specimen of *D. nigrescens* is "das Cönenchym stellenweise doch etwas gestreift". So I think there is no real difference between the species of DANA and that of EHRENBERG.

From Stat. 277 I have numerous young specimens, some consisting of only a few calicles, but showing the typical method of branching.

*2. *Dendrophyllia japonica* nov. spec. (Plate VII, fig. 6).

Japan. 1 ex.

Corallum arborescent, with thick branches in all directions. Height of the colony 9 cm; the mainstem, just above the enlarged base, 2 cm. thick. The branches are short, ± 5 cm.. The corallites on the branches are arranged in two rows. On some branches they are very crowded and long, giving the branch a fan-shape; this is seen in some branches of *D. micranthus* too. The alternate bending of the corallites forward and backward is to be seen only on one side of a few branches and even than not very clearly; so it seems that the corallites are more irregularly arranged. On the mainstem secondary calicles have developed on the front- and backside. The corallites usually protrude a little (3 à 4 mm.); some are ± 1 cm. long. The ribs on the stem are formed by rows of granulations, with nearly no pores between them. Towards the end of the branches the number of perforations increases and the ribs are more prominent. On the corallites the ribs are low, sometimes with one row of granulations, but generally the granulations are irregularly distributed. The intercostal furrows are here shallow and much perforated.

The calicles are rather wide especially those on the stem and somewhat elliptical in shape (9 × 11 mm.). On the branches they are a little smaller (7 × 8 mm.). The depth of the calicles is 4 to 5 mm.. The septa all project above the edge of the calicle, those of the first and second cycle being somewhat thicker than the others. There are four cycles of septa, a fifth cycle may be developed in some systems, and there are even indications of a sixth cycle. The septa of the two first cycles are larger than the others. The septa of the third cycle, being short, do not reach the columella. The septa next to those of the first order are long and reach the columella. The arrangement of the septa is shown in the accompanying diagram (fig. 3). The edge of the septa of the first and second cycle is entire or with very small teeth, the sides are covered with a few irregularly scattered granulations. The septa of the higher cycles are jaggedly dentate on the edge. There is a well developed columella, ± 5 mm. long, and ± 1 mm. broad, consisting of a spongy network.

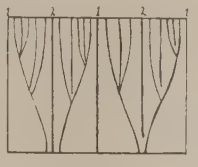

Fig. 3.

3. *Dendrophyllia minuscula* Bourne. (Plate VIII, fig. 30).

Dendrophyllia minuscula Bourne 1905.

Stat. 49a. Sapeh-strait. Depth 69 meter. 2 ex.
Stat. 51. Molo-strait. Depth 69—91 meter. 2 ex.

The following is a description of the specimens of the Siboga-collection:

Corallum dendroid. Gemmation taking place near the calicular margin, sometimes two or three new calicles being formed at the same time, sometimes only one. The corallites are not arranged in rows along the stem and branches, but are irregularly distributed facing in all directions; often two corallites are formed at the same height, one opposite the other. The height of the biggest colony (Stat. 49[a]) is 9 cm.. The corallites are five mm. long at most, they may or may not increase in diameter from the base toward the calicular margin, the long axis of the elliptical calicle being 3.5 to 5 mm., and the short axis 3 to 4 mm.. The costae, visible over the whole length of the stem, are low, flattened above, equal, not perforate, covered with fine irregularly scattered granulations. Intercostal furrows very narrow, with small perforations.

The septa are arranged in three cycles, those of the fourth cycle being developed in a few systems, as is shown in the diagram (fig. 4). In the top-calicles there are always four complete cycles. The septa of the first cycle project very little above the calicular margin; they slope down in the calicle and bend rather suddenly or slowly in a vertical direction. The septa of the higher cycles do not project as far in the calicular fossa as those of the first cycle. All the septa are thin, have an entire edge or small teeth and only a few granulations on the sides.

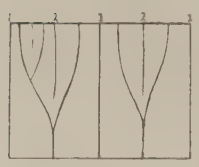

Fig. 4.

The depth of the calicle is from one to two mm., in the axial calicles it may be more. The columella is one mm. long at most, composed of a few, thin, twisted, band-like trabeculae, projecting from the bottom of the calicle.

This species seems to be nearly allied to the *Dendrophyllia gracilis* M.-Edwards and Haime.

The small specimen described by BOURNE seems to have been a young one. The diameter of the calicle is two mm. according to BOURNE, otherwise my specimens agree in all respects with his description and figure.

*4. *Dendrophyllia cribrosa* M.-Edw. et H. (Plate VII, fig. 2).

Dentipora anastomosans de Haan secundum de Blainville 1834.
Dentipora cribrosa de Haan secundum de Blainville 1834.
Dendrophyllia cribrosa Milne-Edwards et Haime 1851.
Dendrophyllia cribrosa Milne-Edwards 1860.

Banka. BUDDINGH leg. Leiden Mus. 1 ex. and 3 pieces. — Japan. NOORDHOEK HECHT leg. 1 ex. — Locality unknown, from Paris Mus., Leiden Mus. 2 ex.

DE BLAINVILLE mentions both his species, adding that they are the *Oculina anastomosans* de Haan and *Oculina cribrosa* de Haan from the collection of the Leiden Museum. There does not exist a description by DE HAAN. MILNE-EDWARDS and HAIME give a good description and are right in uniting both species. The real *D. cribrosa*, according to the old labels, anastomoses also, though not to the same extent. The biggest specimen (from Japan) is 20 cm. high. The figure given by REHBERG (1892) of his *Coenopsammia ramiculosa* resembles somewhat this species, but the figure is bad and the description inadaequate.

5. *Dendrophyllia arbuscula* nov. spec. (Plate VIII, fig. 6).

Stat. 260. 2.3 miles N. 63° W. from the North-point of Nuhu Jaan, Kei-islands. Depth 90 meter. 2 ex.
Stat. 277. Kulewatti-(Sollot-)bay, Dammer-island. Depth 45 meter. 1 ex.

Colony dendroid with the branches in all directions. The abundantly branched specimen from Stat. 277 is 8 cm. high. The specimens from Stat. 260 are branched only once or twice and are 7 and 6 cm. high; the latter is broken off. So the species seems not to be a very large one. Usually there are two branches opposite one another, but often there is only one branch. Budding takes place near the calicular margin. The living soft tissue extends to about 1 cm. from the calicular margin; the surface of the branches is dead, being covered by Bryozoans, Serpulids, etc.. The mainstem of the specimen from Stat. 277 is 1 cm. thick, getting thinner beyond the first branches; in the two specimens from Stat. 260 the mainstem has the same thickness as the corallites, and only the base is enlarged.

The corallites are thinner near the base than near the calicular margin, e.g. respectively 4 and 6 mm. in diameter. The length of simple corallites without buds is nearly 12 mm., often it is less, sometimes more; the longest simple corallite is 22 mm. long. The ribs are rectilinear to the base of the colony, slightly prominent and thickly covered with very fine granulations. In the intercostal furrows rows of perforations are present as far as the living tissue extends; beyond that area there are no perforations. There is no epitheca.

Septa in four cycles. Those of the first cycle are larger than the others and slightly exsert above the margin of the calicle. Their edge is entire and they are covered with granulations arranged in rows parallel to the upper edge of the septum, thus forming an angle with that part of the edge that descends perpendicularly in the calicular fossa. All the septa are thin and spongy except near the margin of the calicle. The septa of the second cycle have also the margin entire, but they do not project as far as those of the first cycle in the fossa. The septa of the third cycle are very small; those of the fourth cycle have a dentate edge and unite in front of the septa of the third cycle. The outer septum of the fourth cycle is always larger than the inner one.

The columella is well developed, trabecular and prominent. The depth of the calicle is 4 mm. at most.

6. *Dendrophyllia axifuga* M.-Edw. et H. (Plate VII, fig. 1).

Dendrophyllia axifuga Milne-Edwards et Haime 1848
Dendrophyllia axifuga Milne-Edwards 1860.
Dendrophyllia axifuga Quelch 1886.

Stat. 299. Buka- or Cyrus-bay, South-coast of Rotti-island. Depth 34 meter. 3 ex.
Stat. 301. Pepela-bay, East-coast of Rotti-island. Depth 22 meter. 4 pieces apparently belonging together.

The method of branching is very typical for this species. The simple corallites are cylindrical, sometimes 3 cm. long, usually shorter. The budding takes place at the edge of the calicle, one or two buds are formed at a time and always at the outer side of the calicle, i.e.,

that side that is turned away from the corallite of the next older generation. All calicles are nearly on the same level, so that the colony is not very high (8 cm.) but broad (17 cm.). Ribs are not developed; the outer surface of the corallum is covered by fine, often interrupted lamellae, parallel to the long axis, with fine spines on the edge. They are much smaller than the furrows between them and more numerous than the septa. The wall is very much perforated. There is something of an epithica in the basal portions of the colony, consisting of fine irregular rings.

The arrangement of the septa is shown in the accompanying diagram (fig. 5). The septa are not exsert. Those of the first and second cycle are similar, and rather small, so that the calicular fossa is wide. At the edge of the calicle the septa may be very small, becoming gradually broader towards the columella, or they may slope down with a faint bend and than descend perpendicularly downwards. The edge is entire, there are a few granulations on the sides. The septa of higher cycles have teeth on the edge; deeper down in the calicle those teeth become smaller and disappear altogether. The septa of the first and second cycle are thickened near the columella. The calicle is round and has a diameter of ± 10 mm.; the depth is 6 mm.. The columella is well developed, plane or sometimes concave, lamellate and measures 4 × 3.5 mm.

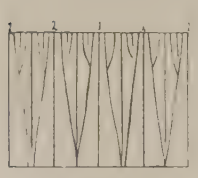

Fig. 5.

7. *Dendrophyllia florulenta* nov. spec. (Plate VII, fig. 5).

Stat. 51. Molo-strait. Depth 69—91 meter. 1 ex.
Stat. 305. Mid-channel in Solor-strait off Kampong Menanga. Depth 113 meter. 1 ex.

Both specimens consist of a single branch. The method of branching is very characteristic. The corallites are all situated in the same plane. Budding takes place near the calicular margin, every corallite forming only one new corallite, and at the colony as a whole the alternating buds are formed to the right and left. In that way the colony seems to consist of a zigzag stem with the calicles at the corners. Every separate corallite is about 1 cm. long and the distance between the calicular margin of the mother-corallite and the base of the daughter-corallite is 2 mm..

The ribs are low, covered with few, fine, irregularly scattered granulations. The intercostal furrows are perforated and shallow, so that the ribs are not very apparent. The calicle is 6.5 × 4.5 mm. wide.

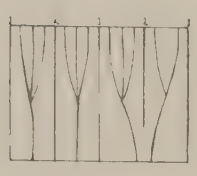

Fig. 6.

The septa are prominently exsert, those of the first cycle more protruding than those of the second cycle. The arrangement is shown in the diagram (fig. 6). Margins of the septa of first and second cycles entire, those of the higher cycles jaggedly dentate. Columella not projecting, ± 2 mm. long, consisting of a trabecular network.

The specimen from Stat. 51 is 33 mm. long and consists of five corallites, the figured specimen from Stat. 305 is 40 mm. long, consisting of six corallites, the youngest of which is still small.

8. *Dendrophyllia ehrenbergiana* (M.-Edw. et H.). (Plate VII, fig. 3 and 4).

Tubastraea coccinea Lesson 1834.
Coenopsammia Ehrenbergiana Milne-Edwards et Haime 1848.
Coenopsammia Ehrenbergiana Milne-Edwards 1860.
Cönopsammia Ehrenbergiana Klunzinger 1879.
Dendrophyllia ehrenbergiana Brüggemann 1879.
Dendrophyllia ehrenbergiana Ridley 1883.
Dendrophyllia coarctata Duncan 1886.
Coenopsammia ehrenbergiana Koch 1886.
Coenopsammia ehrenbergiana Ortmann 1889.
Coenopsammia ehrenbergiana Marenzeller 1907c.

Stat. 231. Ambon. Depth 40 meter. 2 ex.

With some hesitation I identified these specimens as belonging to this species. The description of the specimens that I have at hand is as follows:

The corallum is incrusting, the expanded base is formed only by the initial corallite and the two first formed by budding. The arrangement of the cylindrical corallites is a very regular one; they are placed symmetrically in regard to the initial corallite, and so there are always two corallites of the same age. Budding is basal. The height of the colony is 47 mm. and the initial corallite is 16 × 14 mm. wide at the calicular margin, surpassing in this respect the measures given by KLUNZINGER.

The ribs are clearly visible, running straight to the base. They are narrower than the intercostal furrows and connected by horizontal trabeculae across these furrows. They have one row of fine spines on the edge. The wall is much perforated in the furrows. Septa not exsert, thin. The arrangement of the septa in five incomplete cycles is shown in the diagram (fig. 7). Septa of the first cycle gradually getting broader from the margin downwards; the undermost half descends perpendicularly towards the columella. The maximum breadth of these septa is about one-third the diameter of the calicle. Their margins are entire; the septal face possess delicate striae parallel with the edge and very few granulations. The septa of the higher cycles have the edge more or less toothed.

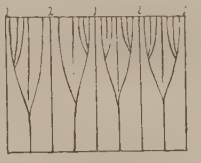

Fig. 7.

The length of the spongy columella is about one-third that of the calicle. The depth of the calicle is about equal its length.

*9. *Dendrophyllia coccinea* (Ehrb.). (Plate VIII, fig. 21).

Oculina coccinea Ehrenberg 1834.
Dendrophyllia semiramea de Haan secundum de Blainville 1834.
Dendrophyllia coccinea Dana 1846.
Cönopsammia coccinea Klunzinger 1879.
Lobopsammia robusta Bourne 1905.
Coenopsammia coccinea Marenzeller 1907c.

Japan. 1 ex. — Japan. Leiden Mus. 1 ex.

This incrusting species can form rather big colonies; the specimen in the Museum at Amsterdam measures 18 × 11 cm. and consists of a great number of corallites. Budding takes

place sometimes near the calicular margin, sometimes basally. The corallites may project to 3.5 cm. above the common base. This base is formed, as in *D. ehrenbergiana*, by the coalescent under parts of the corallites; a true coenenchym does not exist. The corallites have the same diameter throughout their length; they are slightly elliptical, measuring e. g. 14 × 13 mm.. The ribs are broader than the furrows between them; they are not connected by horizontal trabeculae, flat and covered with numerous granulations irregularly distributed over their whole surface. Perforations only in the furrows between the ribs.

The principal septa are sometimes a little exsert; they slope down from the margin increasing in breadth rather rapidly and than fall perpendicularly to the outer edge of the columella; the edge is entire, the sides are covered with very few granulations. Septa of the second cycle a little smaller, those of higher cycles much smaller and with toothed edge.

Columella well developed, slightly prominent or flat, spongy. Depth of the calicle a little more than half its length.

Judging from his description and figure the *Lobopsammia robusta* of BOURNE is synonymous with this species. That fissiparity does not occur is very apparent; BOURNE thought it did.

*10. *Dendrophyllia willeyi* (Gard.). (Plate VIII, fig. 17 and 18).

Coenopsammia willeyi Gardiner 1900.
Dendrophyllia willeyi Vaughan 1918.

Japan. 1 ex.

I am not quite sure about the identity of this specimen; it differs from the typical *D. willeyi* by the by far larger calicles; the biggest calicle in my specimen has a diameter of 20 × 14 mm.. The ribs of my specimen are covered with one row of spines on the edge; these spines are clearly visible with the naked eye, there are about 25 in 1 cm.. In the typical specimen that prof. GARDINER kindly sent me there are no spines on the ribs.

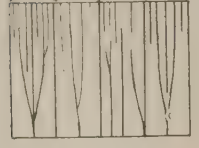

Fig. 8.

The arrangement of the septa deviates markedly from the common type as is shown in the accompanying diagram (fig. 8). This is the case in my specimen as well as in the typical one. The septa of the higher cycles are sometimes interrupted. The different cycles are not always recognizable, but the formation of new septa seems to go according to the general law of v. KOCH.

The calicles in this species are much shorter than in the preceding two species; the biggest one in my specimen is only 12 mm. high.

11. *Dendrophyllia sibogae* nov. spec. (Plate VIII, fig. 19 and 20).

Stat. 282. Anchorage between Nusa Besi and the N. E.-point of Timor. Depth 27—54 meter. 1 ex.
Stat. 303. Haingsisi, Samau-island. Depth up to 36 meter. 2 ex.

Corallum forming clusters of crowded cups, of a rather regular arrangement. The initial calicle is easily recognizable. The height of the colony is 4 cm. The simple corallites are short, 1 cm. at most. Budding takes place near the calicular margin.

The ribs are apparent, narrower than the furrows between them, usually with one row of very fine spines on the edge, sometimes with granulations on the sides. There are large pores in the intercostal furrows. The four cycles of septa are arranged in the typical way, sometimes a rudiment of a fifth cycle is present. The septa are not exsert above the calicular margin. As the septa project only very little into the calicular fossa, this is very wide. In this respect it resembles VERRILL's *Coenopsammia manni*. VAUGHAN (1907) gives a figure of a cotype of VERRILL's species, which shows very clearly the narrow septa and wide calicle, but not so the figure of the specimen of VAUGHAN's collection. The septa increase downward very slowly in breadth and join the columella. The septa of the first cycle have fine teeth on the edge and are much granulated on the sides. The septa of the second cycle do not project as far as those of the first cycle but have the same aspect. The septa of the higher cycles are much smaller and with long teeth on the edge, sometimes they are represented only by a row of teeth on the inner side of the wall.

The columella is well developed, broad, consisting of twisted lamellae; in the bigger calicles its length is about half that of the calicle, in smaller ones it is shorter, e.g., in a calicle of 10×8 mm. it measures 5×3.5 mm.. The depth of the calicles equals their length.

12. *Dendrophyllia elegans* nov. spec. (Plate VIII, fig. 9 and 10).

Stat. 282. Anchorage between Nusa Besi and the N. E.-point of Timor. Reef. 1 ex.

A cluster of corallites are situated on the top of a broken off stalk that is about 1 cm. long and forms a part of the colony. One of the corallites is bigger than the others; it is the initial corallite, four daughter-corallites are a little smaller, three other ones much smaller. The corallites are connected only at their base, that being the place where new buds are formed, judging from the place of the three little corallites.

The initial corallite and the biggest newly formed ones are 20 mm. long, the three little ones are only a few mm. long. The calicle of the initial corallite is 14×11 mm. wide near the margin. The corallites increase in diameter from the base upwards. As the initial corallite is surrounded by the newly formed ones, it is impossible to get the exact measures of its base. One of the secondary corallites has a diameter of 7×6 mm. at the base and of 9×7 mm. at the top.

The principal costae, corresponding with the septa of the first cycle, are clearly recognizable in the initial corallite, to a smaller extent also in the bigger daughter-corallites. These principal ribs are broader and project more than the other ribs; they consist of irregularly disposed, a little elongated granulae, between which are perforations. The other ribs consist of a single row of granulations, they are very narrow. The rows of granulations get more and more irregular towards the calicular margin, and the wall of the calicle is there very much perforated, thin and very fragile.

The septa are typically arranged in four cycles, a fifth one can be developed in some systems. The septa of the first cycle are prominently exsert. They project for 2 mm. in the calicular fossa. Their upper edge is nearly horizontal, then they fall steeply downwards. The

other septa are very narrow at the margin of the calicle. They slope downwards getting broader. The edge of the septa of the first cycle is entire, the sides are covered by a few granulations and show horizontal striae. The other septa have small teeth on the edge.

The columella is wanting altogether. In this respect it should be a *Stereopsammia*.

13. *Dendrophyllia* spec.

Stat. 15. 7° 2'.6 S., 115° 23'.6 E. Near Kangeang-island. Depth 100 meter. 1 ex.
Stat. 282. Anchorage between Nusa Besi and the N. E.-point of Timor. Reef. 1 ex.
Stat. ? 1 ex.

These three specimens, belonging to three different species, have the calicles much damaged, making the identification impossible.

Balanophyllia Searles Wood.

As I have pointed out before I include in this genus the genera *Rhodopsammia* of SEMPER and *Thecopsammia* of POURTALÈS.

1. *Balanophyllia gigas* Brüggemann. (Plate VIII, fig. 22).

Balanophyllia gigas Brüggemann M.S. (secundum Moseley 1881).
Balanophyllia gigas Moseley 1881.

Stat. 260. 2.3 miles N., 63° W. from the North-point of Nuhu Jaan, Kei-islands. Depth 90 meter. 2 ex.
Japan. 3 ex. — Locality unknown. Leiden Mus. 4 ex.

MOSELEY makes some remarks about this unpublished species of BRÜGGEMANN, comparing it with *B. cornu* and *B. socialis*. I am quite sure that I have before me representatives of the same species.

The following is a description of my specimens:

The conical corallum is very slender near the attached base, increasing in diameter rapidly topwards. The figured specimen has a diameter near the base of 9 mm., whereas the elliptical calicular opening measures 30 × 24 mm.. The other specimens are even more slender. The corallum is bent in some direction, it may be parallel to the long axis or parallel to the short axis of the calicle, or intermediate between them. The wall is covered by a dense epitheca extending from the base to about 1 cm. from the margin; sometimes the ribs are wholly concealed by this epitheca, though they are for the most part still visible.

In the upper part the ribs are apparent; they are broader or narrower independently of the arrangement of the corresponding septa. The ribs are flat, roughly granulated, perforate or not, separated by narrow, much perforated furrows.

The septa are typically arranged in five cycles. The septa of the first and second cycle are similar, prominently exsert up to 4 mm. above the calicular margin. They may be spongy near the margin of the calicle or not so. They slope gradually down in the fossa, acquiring a breadth of up to one cm.; then they fall perpendicularly downwards to join the outer margin of

columella. Their edge is entire, the sides are covered with granules which are often arranged the in rows perpendicular to the edge and in rows parallel to the edge. Striae parallel to the edge are often visible. The outer septa of the fifth cycle are broader than those of the fourth and third cycle and nearly as broad as those of the first two cycles. The edge of the septa of the higher cycles is entire or toothed, and the sides are densely covered with granulations.

The columella is trabecular, projecting, its length about half that of the calicle. In one calicle the septa meet in the centrum leaving no room for the columella. The depth of the calicle is about 1 cm..

2. *Balanophyllia fistula* Alcock.

Balanophyllia (Thecopsammia) fistula Alcock 1902.
Thecopsammia fistula v. Marenzeller 1907b.

Stat. 81. Pulu Sebangkatan, Borneo-bank. Depth 34 meter. 1 ex.
Stat. 260. 2.3 miles N., 63° W. from the North point of Nuhu Jaan, Kei-islands. Depth 90 meter. 3 ex.
Stat. 310. 8° 30′ S., 119° 7′.5 E. Sapeh-strait. Depth 73 meter. 1 ex.

Von Marenzeller correctly identified this species, of which Alcock gave a rather short description. The accurate description of v. Marenzeller wholly agrees with the type-specimen.

3. *Balanophyllia rediviva* Mos.

Balanophyllia rediviva Moseley 1881.
Balanophyllia rediviva v. Marenzeller 1907b.

Stat. 260. 2.3 miles N., 63° W. from the North-point of Nuhu Jaan, Kei-islands. Depth 90 meter. 2 ex.

These specimens wholly agree with the description and figures of Moseley and Marenzeller.

4. *Balanophyllia cornucopia* (Pourt.). (Plate VIII, fig. 13).

Dendrophyllia cornucopia Pourtalès 1871.
Dendrophyllia cornucopia Pourtalès 1880.

Stat. 204. Between islands of Wowoni and Buton; Northern entrance of Buton-strait. Depth from 75 to 94 meter. 1 ex.

This species was described by Pourtalès from Key-West. My specimen agrees in all respects with his description. This species is not a *Dendrophyllia* but a *Balanophyllia* with buds. My specimen has only one bud.

*5. *Balanophyllia nouhuysi* nov. spec. (Plate VIII, fig. 16).

East-coast of Sumatra., East from Segli. Depth about 100 meter. Van Nouhuys leg. 1 ex.

Corallum cylindrical, attached with a spreading base. As is shown in the figure the corallum is Y-shaped, with two corallites. In this respect it should be a *Dendrophyllia.* But as the corallites do not show the slightest tendency to fork or bud again, I think it is an accident.

The height of the corallum is 4 cm., both corallites have the same height. The common stem has a diameter of 8 mm., the separate corallites of 7 mm..

A thin, porous epitheca extends from the base to about 1.5 cm. from the upper margin. The ribs are narrow, but apparent from the top to the base. In the basal part of the corallum they are covered by one or more rows of fine pointed granules. In the upper part above the epitheca the ribs are covered by larger and very irregular granules, and the wall is much perforated. The principal costae corresponding with the septa of the first cycle are prominent.

The septa are arranged in four complete cycles. The septa of the first order are much exsert, projecting 2 mm. above the margin of the calicle, those of the second cycle project one mm.; the projecting part of the septa is spongy, otherwise they are thin. The septa slope down, till they project about one third of the diameter of the calicle, then fall perpendicularly towards the bottom. The septa of the second cycle are narrower than those of the first one. The edge is entire; nearly no granules on the faces. Septa of the fourth cycle broader than those of the third, joining in front of the latter near the columella. The edge of these septa is provided with small teeth. Columella well developed, very prominent, trabecular, 3 mm. long. The diameter of the elliptical calicles is 8×7 and 7×6 mm. and their depth about 4 mm.

6. *Balanophyllia imperialis* Sav. Kent. (Plate VIII, fig. 23—29).

Balanophyllia imperialis Saville Kent 1871.
Balanophyllia malaccensis Saville Kent 1871.
Balanophyllia gemmifera Klunzinger 1879.
Balanophyllia malaccensis Moseley 1881.
Eupsammia regalis Alcock 1893.
Balanophyllia cornu Alcock 1902.
Balanophyllia gemmifera v. Marenzeller 1907 c.

Stat. 153. 0° 3'.8 N., 130° 24'.3 E. Near Jen-islands. Depth 141 meter. 14 ex.
Stat. 260. 2.3 miles N., 63° W. from the North-point of Nuhu-Jaan, Kei-islands. Depth 90 meter. 4 ex.
Stat. 289. 9° 0'.3 S., 126° 24'.5 E. Near South-coast of Timor. Depth 112 meter. About 20 ex.

I have good reasons for the above given synonymy of this species. The *Balanophyllia cornu* mentioned by Alcock in 1902 from Stat. 297 of the Siboga Expedition is not a true *Balanophyllia cornu*. According to Moseley's description the septa are in *B. cornu* very slightly exsert, the wall very finely perforated and the costae composed of fine but sharp granules. In all these characters this specimen of the Siboga Expedition does not agree with the description, but it agrees in all respects with my specimens as is shown in the figure.

The only differences in the descriptions of *Balanophyllia imperialis* Sav. Kent and *Eupsammia regalis* Alcock are that the first mentioned is attached by a slender base and has the ribs conspicuous from the base to the margin, and the latter is free from traces of former adhesion and the costae are distinct in the upper two-thirds of the corallum. Now my specimens are attached to small shells, and pieces of coral, often also on the corallum of the same or another species. The original support is often very small, and by continued growth it is wholly included in the basal portion of the corallum, which is then apparently free (see fig. 28 and 29 on

Plate VIII). Often also the slender base is broken off and regenerated. When the corallum is free the ribs are often worn off in the basal portion of the corallum; that is clearly shown by a few larger specimens, but when the corallum is attached or young the ribs are conspicuous from the base to the margin. So I do not think that there is any difference between these two species.

Balanophyllia malaccensis Sav. Kent seems to be a young specimen of the same species. Some of the younger specimens that I could examine quite agree with the description of SAVILLE KENT and the description and figure of *Balanophyllia floridana* Pourtalès, which species is very similar to *B. malaccensis* according to SAVILLE KENT differing only in the form of the columella and the granulations on the septa.

The *Balanophyllia gemmifera* Klunzinger has a well-developed epitheca, whereas in my specimens the epitheca is usually absent. But I have also specimens with an epitheca, though it is never complete, consisting only of scattered patches. I do not think, that this difference allows a specific separation.

As is shown in the figures the general aspect of the corallum varies a good deal. It is always conical, with a narrow base and a wide top. But it may be very slender and long or blunt and short, it may be curved, sometimes twice or more in different directions, or erect. It may be attached or free; simple or with buds, sometimes of three or four generations.

The formation of buds is shown by all the specimens from Stat. 289. As many buds had broken off from the parental calicle, the exact number of specimens was not to be determined. The buds are fixed on the wall, sometimes near the base, sometimes near the top, often on the calicular margin, or even on the septa. But I am not quite sure whether they are really buds at all and not oözoites. I found specimens attached to shells, on dead pieces of coral, to the wall and to the calicular margin of a *Flabellum* exactly in the same way as to the so-called parental calicle. The bottom of Station 289 consists of mud, sand and shells. It is quite possible that the older corallites are a welcome point of support for the attaching oözoites.

The length of the corallite is up to 5 cm.. The calicle is elliptical in shape, measuring e. g. 14 × 12 mm. or 16 × 12 mm.. The ribs are roughly granulated; the principal costae can project a little more than the others. Septa in the older calicles in five incomplete cycles, in younger there are four cycles. Septa of the first and second cycle equal, markedly exsert, spongy at the upper margin, having the edge entire, and granules on the sides. The septa of the higher cycles roughly dentate. Columella well developed, prominent, spongy, it length nearly half that of the calicle. The depth of the calicle is half its length.

7. *Balanophyllia scabra* Alcock.

Balanophyllia scabra Alcock 1893.

Stat. 47. Bay of Bima. Depth 55 meter. 1 ex.
Stat. 49[a]. Sapeh-strait. Depth 69 meter. 1 ex.

Though the calicle is not very deep, I think the specimen from Stat. 49[a] is a

representative of this species. The specimen from Stat. 47 is a young one, and I am not sure about its identity.

8. *Balanophyllia bairdiana* M.-Edw. et H. (Plate VIII, fig. 3 and 8).

Balanophyllia bairdiana Milne-Edwards et Haime 1848.
Balanophyllia bairdiana Milne-Edwards 1860.
Balanophyllia bairdiana Moseley 1881.

Stat. 117. Kwandang-bay-entrance. Depth 80 meter. 6 ex.
Stat. 164. 1°42'.5 S., 130°47'.5 E. Arafura-sea. Depth 32 meter. 3 ex.
Stat. 310. 8°30' S., 119°7'.5 E. Sapeh-strait. Depth 73 meter. 2 ex.

The fullgrown specimens from Stat. 310 agree in all respects with the descriptions of MILNE-EDWARDS and HAIME, and MOSELEY, though the narrow basal part is longer than in MOSELEY's figure. The specimens from Stat. 117 and Stat. 164 are young ones, attached to the same support in each case. Only the older ones, about 1 cm. high, can be identified as belonging to this species.

9. *Balanophyllia parallela* (Semper).

Rhodopsammia parallela Semper 1872.
Rhodopsammia carinata Semper 1872.
Rhodopsammia amoena Semper 1872.
Rhodopsammia parallela Quelch 1886.
Rhodopsammia carinata Alcock 1893.
Balanophyllia parallela Bourne 1905.

Stat. 240. Banda. Depth from 9—45 meter. 6 ex.

According to MARENZELLER (1907a) these species of SEMPER are identical. My specimens agree mostly with SEMPER's description of *Rhodopsammia carinata*. Buds are not formed.

10. *Balanophyllia affinis* (Semper).

Rhodopsammia socialis Semper 1872.
Rhodopsammia affinis Semper 1872.
Rhodopsammia ovalis Semper 1872.
Rhodopsammia incerta Semper 1872.
Rhodopsammia dubia Semper 1872.
Rhodopsammia socialis Alcock 1893.
Balanophyllia socialis Bourne 1905.

Stat. 204. Between islands of Wowoni and Buton, Northern entrance of Buton-strait. Depth from 75—94 meter. 1 ex.

MARENZELLER (1907a), who could examine the type specimens of SEMPER joined together these species of SEMPER in a single species: *Rhodopsammia socialis*. But as I include the genera *Rhodopsammia* and *Thecopsammia* in the genus *Balanophyllia*, the name *Balanophyllia socialis* is preoccupied by the *Thecopsammia socialis* of POURTALÈS. I will preserve the name *Balanophyllia affinis*. The specimen is attached to the centre of the calicle of a specimen of the same species.

11. *Balanophyllia tenuis* nov. spec. (Plate VII, fig. 8).

Stat. 96. South-east side of Pearl-bank, Sulu-archipelago. Depth 15 meter. 1 ex.

Corallite conical; the base is broken off. There are a few winglike expansions covering other objects connected with the theca. On one of these expansions a young bud is attached; an older bud is connected with the main corallite by an other expansion; the broken off base of this bud projects at the underside in the same way as that of the main corallite. The wall is perforated only near the calicular margin. There are neither epitheca nor ribs. The wall is somewhat angular, and the projections correspond with the septa of the first and second cycle. It is covered by irregularly scattered, fine, pointed, sometimes needle-like granulae. The height of the corallite is 2 cm., the diameter of the broken off base is 4 mm. and that of the elliptical calicle 9 × 7.5 mm.. The calicles of the buds are round.

The septa are arranged in four cycles. Those of the first cycle are much exsert, those of the second cycle to a less extent. They have the same shape, though those of the first cycle are broader. The septa are spongy near the calicular margin. The septal faces are covered by a few granules. The septa of the fourth cycle are much broader than those of the third one. They join together about halfway between the margin and the columella. All septa have the edge entire, but those of the higher cycles are more granular on the sides than those of the first and second cycles.

The columella is rather well developed, its length being one-third of that of the calicle. It is trabecular and not prominent. The depth of the calicle is about half its length.

12. *Balanophyllia regularis* (Gard.).

Thecopsammia regularis Gardiner 1898.

Stat. 213. Zuid-Eiland near Saleyer. 30 ex.

These specimens correspond in all respects with the description and figure given by Gardiner, save that some specimens increase in diameter from the base upwards.

13. *Balanophyllia cumingi* M.-Edw. et H.

Balanophyllia cumingi Milne-Edwards et Haime 1848.
Balanophyllia cumingi Milne-Edwards 1860.
Balanophyllia cumingi Bourne 1905.
Balanophyllia cumingi Bedot 1907.

Stat. 257. Du-roa-strait, Kei-islands. Depth till 52 meter. 1 ex.

This is a young specimen of 9 mm. height. No septa of the fifth cycle have developed. According to Verrill (1864) the *Dendrophyllia scabrosa* Dana is synonymous with this species. It may be right but the description given by Dana is rather insufficient.

14. *Balanophyllia elongata* (Mos.).

Thecopsammia elongata Moseley 1881.

Stat. 289. 9° 0'.3 S., 126° 24'.5 E. South-coast of Timor. Depth 112 meter. 1 ex.

This is a bad specimen, the calicle being mutilated. I am not sure about its identity, but it agrees in most respects with the description of this species.

15. *Balanophyllia italica* (Michelin).

Caryophyllia italica Michelin 1841.
Balanophyllia italica Milne-Edwards 1860.
Balanophyllia italica Lacaze-Duthiers 1897.
Balanophyllia italica Marenzeller 1907.

Stat. 49a. Sapeh-strait. Depth 69 meter. 1 ex.

This specimen belongs pretty certainly to this species, though the calicle is not as deep as it ought to be. But the calicle has been broken off and is in proces of regeneration. This Mediterranean species is described by MARENZELLER from the Red Sea.

16. *Balanophyllia* spec.

Stat. 59. Western entrance Samau-strait. Depth 390 meter. 1 ex.
Stat. 95. 5° 43'.5 N., 119° 40' E. Sulu-archipelago. Depth 522 meter. 3 ex.
Stat. 107. Channel between the islands of Sulu and Bangalao. Depth 580 meter. 1 ex.
Stat. 172. Gisser. Depth 18 meter. 1 ex.
Stat. 310. 8° 30' S., 119° 7'.5 E. Sapeh-strait. Depth 73 meter. 1 ex.

As these specimens are too much damaged or too young, identification was not possible.

Rhizopsammia Verrill.

The genus *Rhizopsammia* established by VERRILL (1867) is nearly allied to *Balanophyllia*; the only difference is the method of budding by stolon-like expansions in *Rhizopsammia*. As the paliform lobes are absent in the species here described their presence is not a generic character. The same is true for the absence of the epitheca, which is well developed in my *Rhizopsammia minuta*.

1. *Rhizopsammia verrilli* nov. spec. (Plate VIII, fig. 1 and 2).

Stat. 220. Anchorage off Pasir Pandjang, West-coast of Binongka. Depth 278 meter. 2 ex.
Stat. 282. Anchorage between Nusa Besi and the N.E.-point of Timor. Depth from 27 till 54 meter. 2 ex.

The colonies are attached to stones, one of which is covered on the other side by an *Acropora*. The largest colony measures 7 × 8 cm.. The distance between the corallites is variable, it may be a few millimeters or a few centimeters. The stolon-like expansions are about 3 mm. broad. The ribs are continued on the stolons. The largest corallite is 34 mm high. The corallites increase in diameter from the base to the top, this largest corallite measuring near the base 8 mm. in diameter and near the calicular margin 10 × 11 mm. The walls are thin and very porous, the pores are in the furrows as well as on the ribs. The ribs are covered with irregularly scattered granules.

Septa arranged in five incomplete cycles. Those of the first cycle slightly projecting above the calicular margin; they are rounded at the top which is spongy; the inner edge falls perpendicularly towards the columella. The edge is entire or with minute teeth, the sides are covered with granules. The septa of the second cycle are a little smaller than those of the first one, but have the same aspect. The septa of the higher cycles are dentate on the edge. Those of the fourth cycle join in pairs in front of those of the third cycle. The septa of the fifth cycle are very small.

No paliform lobes. Columella well developed, spongy. It measures 5 × 3 mm. in a calicle with a diameter of 11 × 9 mm. The depth of the calicle is about 5 mm.

Broken off calicles are not to be recognized from a *Balanophyllia*. The two specimens of Stat. 220 are broken off calicles, but one of them shows clearly the stumps of the stolons.

2. *Rhizopsammia minuta* nov. spec. (Plate VII, fig. 9 and 10).

Stat. 279. Ruma-Kuda-bay, Roma-island. Depth 36 meter. 1 ex.

I have before me a large colony consisting of a great number of corallites incrusting an irregular rough stone. The stolons which spread over the surface of the stone in every direction consist of a trabecular network; they are not covered by ribs. The breadth of the stolon-like expansions is very variable, from one to five mm. The distance between the separate calicles is also very variable, they may touch one another or there may be a distance of one cm. between them.

The corallites are small, not projecting more than two mm. above the base; they are cylindrical or a little tapering towards the top; their round calicle has a diameter of 5 mm. at most but usually less. Some of the corallites, and these are usually the smaller ones, are covered by a dense epitheca from the base to the calicular margin, in others only the basal part of the wall is covered by an epitheca; the uncovered upper portion may be one mm. or even two mm. long. The ribs are broad and flat, they may be smooth or covered by a few small, blunt granules. The small perforations of the wall are restricted to the furrows.

The septa are arranged in four cycles which are usually incomplete. There may be a fifth cycle in a few systems of the largest calicles. The septa are exsert. Those of the first and second cycle are a little broader than the others near the calicular margin. The edge of the projecting part of the septa makes a curve of half a circle, than the septa slope gradually to the interior. As the septa are rather narrow near the top and all about of the same breadth the calicular fossa is regularly funnel-shaped. All the septa have teeth on the edge and are densely granulated on the sides, they are equally thin and nowhere spongy. The septa of the third cycle are short, those of the fourth cycle unite in pairs in front of those of the third cycle. In the smaller calicles also the septa of the second cycle do not reach the columella.

No paliform lobes. The columella is concave, trabecular, its length being about one-third that of the calicle. Most of the calicles are very deep, their depth equaling their diameter. Other calicles are not so deep.

Heteropsammia Milne-Edwards et Haime.

Prof. SLUITER (1907) has given a report about the symbiosis of these corals with the Sipunculid-worms, in this case the *Aspidosiphon corallicola* Sluiter.

1. *Heteropsammia michelini* M.-Edw. et H. (Plate VIII, fig. 7).

Heteropsammia Michelini Milne-Edwards et Haime 1848.
Heterocyathus eupsammides Gray 1850.
Heteropsammia Michelini Milne-Edwards 1860.
Heteropsammia Michelini Semper 1872.
Lobopsammia Michelini Tenison-Woods 1879.
Heteropsammia michelini Moseley 1881.
Heteropsammia michelini Bourne 1905.

Stat. 33. Bay of Pidjot, Lombok. Depth 22 meter and less. 391 ex.
Stat. 37. Sailus ketjil, Paternoster-islands. Depth 27 meter and less. 4 ex.
Stat. 43. Anchorage off Pulu Sarassa, Postillon-islands. Depth up to 36 meter. 10 ex.
Stat. 47. Bay of Bima. Depth 55 meter. 2 ex.
Stat. 49a. Sapeh-strait. Depth 69 meter. 1 ex.
Stat. 71. Makassar. Depth up to 32 meter. 1 ex.
Stat. 114. Kwandang-bay-entrance. Depth 75 meter. 1 ex.
Stat. 116. West of Kwandang-bay-entrance. Depth 72 meter. 3 ex.
Stat. 142. Anchorage off Laiwui, coast of Obi Major. Depth 23 meter. 1 ex.
Stat. 240. Banda. Depth from 9 till 45 meter. 3 ex.
Stat. 313. Anchorage East of Dangar Besar, Saleh-bay. Depth up to 36 meter. 136 ex.
Stat. 315. Anchorage East of Sailus Besar, Paternoster-islands. Depth up to 36 meter. 1 ex.

Two different forms can be recognized in this species, which are connected by transitional stages. The typical form of *Heteropsammia michelini* has according to MILNE-EDWARDS and HAIME the septa of the first, second and third cycles equal, exsert and thickened. In the other form these septa are hardly thicker than those of the higher cycles and they are not exsert, which is very conspicuous. The granules of the ribs are also finer, so that the ribs are not so clearly visible.

2. *Heteropsammia cochlea* (Spengler).

Madrepora cochlea Spengler 1781.
Heterocyathus cochlea Gray 1850.
Heteropsammia cochlea Milne-Edwards 1860.
Heteropsammia rotundata Semper 1872.
Heteropsammia rotundata Alcock 1893.
Heteropsammia aphrodes Alcock 1893.
Heteropsammia cochlea Bouvier 1895.

Stat. 7. Near reef of Batjulmati (Java). Depth 15 meter and more. 3 ex.
Stat. 33. Bay of Pidjot, Lombok. Depth 22 meter and less. 27 ex.
Stat. 47. Bay of Bima. Depth 55 meter. 1 ex.
Stat. 64. Kambaragi-bay, Tanah Djampeah. Depth up to 32 meter. 3 ex.
Stat. 91. Muaras-reef, inner side, East-coast of Borneo. Depth up to 54 meter. 2 ex.
Stat. 114. Kwandang-bay-entrance. Depth 75 meter. 6 ex.
Stat. 116. West of Kwandang-bay-entrance. Depth 72 meter. 45 ex.

Stat. 142. Anchorage off Laiwui, coast of Obi Major. Depth 23 meter. 2 ex.
Stat. 154. 0°7'.2 N., 130°25'.5 E. North of Waigeu. Depth 83 meter. 1 ex.
Stat. 162. Between Loslos and Broken-islands, West-coast of Salawatti. Depth 18 meter. 1 ex.
Stat. 164. 1°42'.5 S., 130°47'.5 E. Arafura-sea. Depth 32 meter. 4 ex.
Stat. 240. Banda. Depth from 9 to 45 meter. 2 ex.
Stat. 303. Haingsisi, Samau-island. Depth up to 36 meter. 1 ex.
Stat. 310. 8°30' S., 119°7'.5 E. Sapeh-strait. Depth 73 meter. 1 ex.

BOUVIER gives a good description of the specimen of MILNE-EDWARDS and HAIME and also a good figure. The *Heteropsammia rotundata* of SEMPER agrees in all respects with this description. The "pali" mentioned by SEMPER are clearly visible in some specimens, in others they are less developed, and are sometimes wanting altogether. Also I could not find any difference with the *Heteropsammia aphrodes* of ALCOCK. The base is in some specimens as long as the calicle, in other specimens it is a little longer.

3. *Heteropsammia geminata* Verrill.

Heteropsammia geminata Verrill 1870.
Lobopsammia Michelini Tenison-Woods 1879?
Heteropsammia multilobata Moseley 1881.
Heteropsammia geminata Alcock 1893.

Stat. 90. 1°17'.5 N., 118°53' E. East of Borneo. Depth 281 meter. 6 ex.
Stat. 240. Banda. Depth from 9 to 45 meter. 1 ex.

According to TENISON-WOODS the *Heteropsammia michelini* is often compound; he had every gradation from the oval calicle passing to the figure of 8-outline until it is finally separated by fissiparity. I examined several hundreds of specimens of *Heteropsammia michelini* and found one in which the septa of both sides touch and only one in which the separation in two calicles is complete. This latter too is an obvious *H. michelini*. In this species of VERRILL and MOSELEY separation is the rule; small specimens (7 mm. long) already have the margin of the calicle irregularly curved, indicating in this way the beginning of the formation of new calicles by fissiparity. This phenomenon seems to be a very rare exception in *H. michelini*. I think that TENISON-WOODS had these two species mixed together.

The *Heteropsammia multilobata* Moseley is undoubtedly synonymous with the *H. geminata* of VERRILL. VERRILL seems to have examined only young specimens. He says: the corallites are but little elevated. That is the case in my small specimens. The two biggest specimens have the corallites elevated a few millimeters above the common base, agreeing in this respect with the description of MOSELEY. And that is the only difference between the species of VERRILL and MOSELEY.

4. *Heteropsammia* spec.

Stat. 2. Madura-strait. Depth 56 meter. 1 ex.
Stat. 116. West of Kwandang-bay-entrance. Depth 72 meter. 2 ex.
Stat. 153. 0°3'.8 N., 130°24'.3 E. North of Waigeu. Depth 141 meter. 1 ex.

These specimens are very young or much damaged. That of Stat. 153 may be a *Heteropsammia michelini*.

Endopachys Londsdale.

1. *Endopachys grayi* M.-Edw. et H.

Endopachys grayi Milne-Edwards et Haime 1848.
Endopachys grayi Milne-Edwards 1860.
Endopachys grayi Semper 1872.

Stat. 51. Molo-strait. Depth from 69 to 91 meter. 1 ex.
Stat. 153. 0° 3'.8 N., 130° 24'.3 E. North of Waigeu. Depth 141 meter. 1 ex.

The specimen from Stat. 51 is 26 mm. high. This is an old specimen with the lateral crests much worn.

2. *Endopachys* spec. (Plate VIII, fig. 4).

Stat. 51. Molo-strait. Depth from 69 to 91 meter. 1 ex.

This specimen may be a juvenile stage of the preceding species. As VAUGHAN (1907) says *Endopachys* is attached with a stalk during its youth. So this specimen. The stalk is 4×3 mm. thick and the calicle has a diameter of 7.5×4 mm.

Leptopsammia M.-Edw. et H.

As I have pointed out before this genus differs from all the other Eupsammidae by the arrangement of the septa.

1. *Leptopsammia stokesiana* M.-Edw. et H. (Plate VIII, fig. 5).

Leptopsammia stokesiana Milne-Edwards et Haime 1848.
Leptopsammia stokesiana Milne-Edwards 1860.

Stat. 49a. Sapeh-strait. Depth 69 meter. 1 ex.

This specimen wholly agrees with the description and figure given by MILNE-EDWARDS and HAIME. In all respects except the septa it resembles the *Balanophyllia cornu* of MOSELEY.

2. *Leptopsammia conica* nov. spec. (Plate VIII, fig. 14 and 15).

Stat. 311. Sapeh-bay, East-coast of Sumbawa. Depth up to 36 meter. 2 ex.

Corallum regularly conical, the base a slightly rounded point. It is free; there is even not a trace of former attachment, nor a shell or anything else included in the basal part. The height of the bigger specimen is 22 mm. and of the smaller one 8 mm..

The ribs are obvious from the top to the basal point. They are narrower than the furrows between them, irregularly covered with rough granules and slightly prominent. The wall is much perforated on the ribs as well as in the furrows. In the older specimen the calicle is slightly oval in shape, measuring 13×11.5 mm., in the younger one it is round, its diameter is 7 mm.

The septa are arranged in five complete cycles as is shown in the diagram (fig. 9). The septa of the first and second cycle are slightly exsert. They have the same shape, only those of the first cycle are a little broader than those of the second. The upper half of these septa bends gradually downwards acquiring a breadth of one-third the calicular diameter; the lower half falls perpendicularly downwards. The septa of all cycles have the edge entire, the septal faces are covered with granules arranged in regular rows parallel to the edge and possess obvious striae. The septa of the fourth cycle may or may not join those of the third cycle.

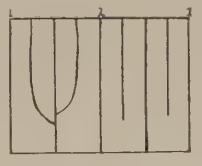

Fig. 9.

The columella is small, its length being about one-fourth that of the calicle, formed by thin, twisted, coalescent lamellae, and prominent. The depth of the calicular fossa in the biggest specimen is 8 mm. and in the smallest 3 mm..

3. *Leptopsammia crassa* nov. spec. (Plate VIII, fig. 11 and 12).

Stat. 258. Tual-anchorage, Kei-islands. Depth 22 meter. 1 ex.

This specimen is irregularly shaped; it is attached at one side and has thirteen principal septa. It increases in diameter from the base to the top; the diameter is 6 mm. near the base and the diameter of the calicle is 12 × 10 mm.. The basal portion is covered with a thin epitheca.

The ribs are very indistinct, slightly projecting with shallow furrows between them. They are formed in the under portion of the corallite upwards to about four millimeters from the calicular margin by rows of fine, regular granules, with pores on the ribs and in the furrows. The uppermost portion of the corallite is covered with rough, irregular granulations and has irregular, large pores; in this part the ribs are nearly invisible.

The edge of the calicle is thickened, but the septa are thin over their whole extent. They are irregularly arranged at one side as is shown in the figure. They are not exsert. Those of the second cycle are equal to those of the first one. There are small teeth on the edge and very few small granules on the sides. They curve gradually downwards to about one-third of their length and one-third of the calicular diameter, then they fall perpendicularly to the interior. The septa of the third cycle are much smaller, with irregular teeth on the edge. Those of the fourth cycle are hardly present, very small, and with one exception not united with those of the third cycle.

Columella rather small, about three mm. long, prominent, formed by a twisted lamella. The depth of the calicle is 6 mm.. The shorter axis of the calicular margin is on a slightly higher level than the longer axis.

4. *Leptopsammia pocùlum* nov. spec. (Plate VII, fig. 7).

Stat. 260. 2.3 miles N., 63° W. from the North-point of Nuhu Jaan, Kei-islands. Depth 90 meter. 1 ex.

The corallum is attached by a stalk to a slightly enlarged base. This stalk is 8 mm. long and three mm. thick. Then the diameter increases rapidly to 6 mm.. The upper part is cylindrical, the calicle round. No epitheca. The ribs are broad and flat, separated by narrow,

shallow furrows; they are covered with numerous small granules. Only the upper part of the wall, to about three mm. from the margin, is perforated and even there the pores are few in number and very small, situated on the ribs and in the furrows.

The septa are arranged in four cycles. Those of the first cycle are exsert to about one mm. above the calicular margin, those of the second cycle to one half mm.. The projecting upper portion is spongy, otherwise the septa are thin, their sides being covered with a few small granules. They bend rapidly towards the interior, getting their maximal breadth at about the height of the calicular margin, then they fall steeply downwards. The septa of the fourth cycle are very small and not united with those of the third cycle. The edge of the septa of the first and second cycle is entire, and of the third and fourth cycle covered with minute teeth.

The columella is well developed, spongy, its length is about one half that of the calicle. The diameter of the calicle is 6×5 mm. The specimen is 23 mm. high.

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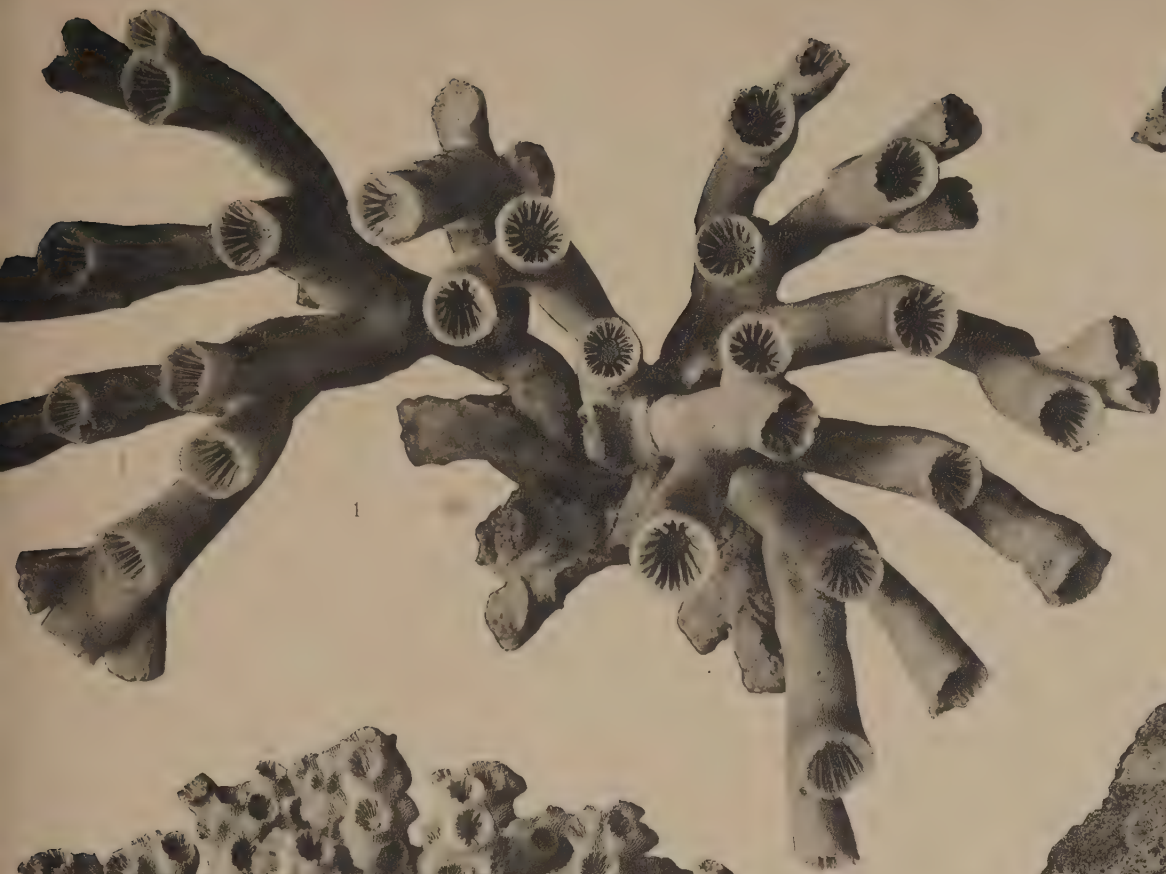
PLATE VII.

Fig. 1. *Dendrophyllia axifuga* M.-Edw. et H. Nat. size.
Fig. 2. *Dendrophyllia cribrosa* M.-Edw. et H. Nat. Size.
Fig. 3. *Dendrophyllia ehrenbergiana* M.-Edw. et H. Nat. size.
Fig. 4. *Dendrophyllia ehrenbergiana* M.-Edw. et H. Calicle enlarged.
Fig. 5. *Dendrophyllia florulenta* nov. spec. Nat. size.
Fig. 6. *Dendrophyllia japonica* nov. spec. Nat. size.
Fig. 7. *Leptopsammia poculum* nov. spec. Nat. size.
Fig. 8. *Balanophyllia tenuis* nov. spec. Nat. size.
Fig. 9. *Rhizopsammia minuta* nov. spec. Nat. size.
Fig. 10. *Rhizopsammia minuta* nov. spec. Part of colony, enlarged.



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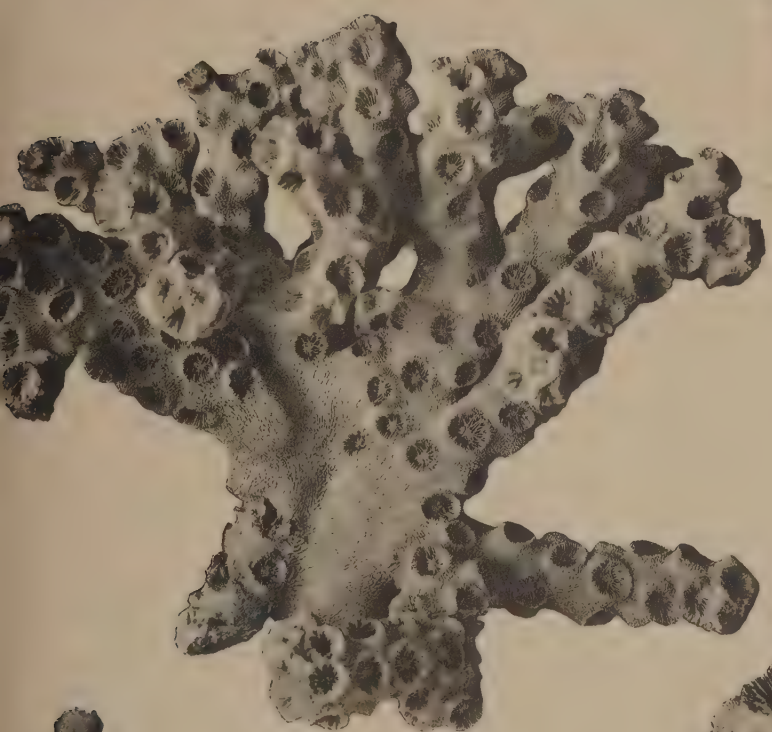

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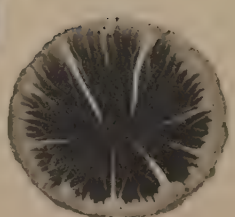

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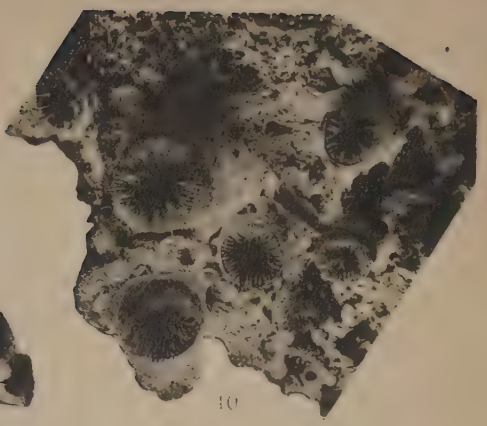

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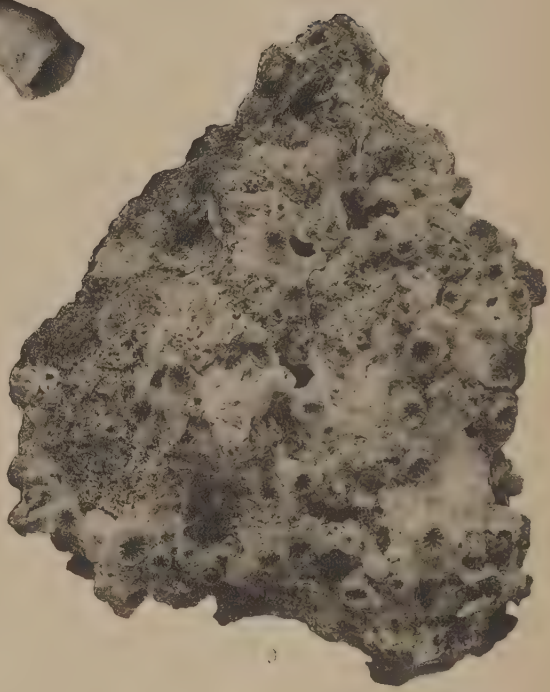

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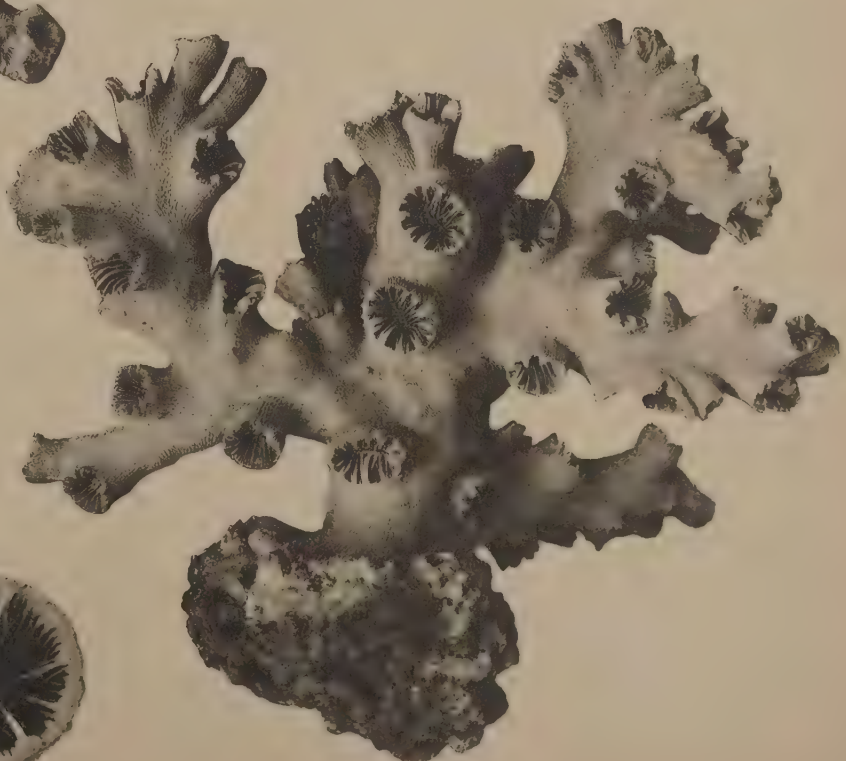

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PLATE VIII.

Fig. 1. *Rhizopsammia verrilli* nov. spec. Nat. size.
Fig. 2. *Rhizopsammia verrilli* nov. spec. Calicle enlarged.
Fig. 3. *Balanophyllia bairdiana* M.-Edw. et H. Nat. size.
Fig. 4. *Endopachys* spec. juv. Nat. size.
Fig. 5. *Leptopsammia stokesiana* M.-Edw. et H. Nat. size.
Fig. 6. *Dendrophyllia arbuscula* nov. spec. Nat. size.
Fig. 7. *Heteropsammia michelini* M.-Edw. et H. Two specimens. Nat. size.
Fig. 8. *Balanophyllia bairdiana* M.-Edw. et H. Several young specimens. Nat. size.
Fig. 9. *Dendrophyllia elegans* nov. spec. Nat. size.
Fig. 10. *Dendrophyllia elegans* nov. spec. Calicle enlarged.
Fig. 11. *Leptopsammia crassa* nov. spec. Nat. size.
Fig. 12. *Leptopsammia crassa* nov. spec. Calicle enlarged.
Fig. 13. *Balanophyllia cornucopia* (Pourt.). Nat. size.
Fig. 14. *Leptopsammia conica* nov. spec. Two specimens. Nat. size.
Fig. 15. *Leptopsammia conica* nov. spec. Calicle enlarged.
Fig. 16. *Balanophyllia nouhuysi* nov. spec. Nat. size.
Fig. 17. *Dendrophyllia willeyi* (Gard.). Nat. size.
Fig. 18. *Dendrophyllia willeyi* (Gard.). Calicle enlarged.
Fig. 19. *Dendrophyllia sibogae* nov. spec. Nat. size.
Fig. 20. *Dendrophyllia sibogae* nov. spec. Calicle enlarged.
Fig. 21. *Dendrophyllia coccinea* (Ehrb). Nat. size.
Fig. 22. *Balanophyllia gigas* Brüggemann. Nat. size.
Fig. 23—29. *Balanophyllia imperialis* Sav. Kent. Nat. size.
Fig. 30. *Dendrophyllia minuscula* Bourne. Nat. size.

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